SOCIETAL IMPACTS OF MICROELECTRONICS

Ontario

Ministry of
Transportation and
Communications

COMMUNICATIONS
POLICY BRANCH
March, 1982

SOCIETAL IMPACTS

OF

MICROELECTRONICS

J. David Long
John A. O'Flynn
Robert M. Rosenbaum

Study commissioned under the Government of
Ontario Microelectronics Task Force.

Published by:
Communications Policy Branch
Ontario Ministry of Transportation and Communications

For additional copies write:
J.A. O'Flynn
Communications Policy Branch
Ministry of Transportation and Communications
1201 Wilson Avenue
Downsview, Ontario
M3M 1J8

March 1982

TABLE OF CONTENTS

PAGE

EXECUTIVE SUMMARY ..... (i)

I. INTRODUCTION 1

II. BACKGROUND 2

A. Government Leadership and Innovation 2

B. Flexible, Long Term Policy Development 3

C. Inherent Strengths of Ontario/Canada 4

III. ISSUES AND RECOMMENDATIONS 5

A. The Work Environment 5

1. Productivity and the quality of working life
2. The relationship between business and labour

B. Skills and Knowledge 9

1. Education/training and the demand for new skills and knowledge
2. Computer literacy
3. Special groups

C. Public Interest 15

1. Public access to information services
2. Public awareness and education
3. Public concerns

IV. APPENDICES 22

A. Selected Bibliography 22

B. Consultants and Research Staff 34

C. Poll of Public Opinion Related to the Societal Impacts of Microelectronics 37

EXECUTIVE SUMMARY

Three major areas of societal impact were identified: work environment, skills and knowledge, and public interest. A number of issues are summarized below for each area with a corresponding recommendation. These recommendations are intended to be suggestive of the role that governments can play in ensuring that all of society benefits as microelectronics technology is developed and applied. Some further ideas for implementation of the recommendation are also suggested.

A. The Work Environment

1.

ISSUE: *The introduction of microelectronics into the work place could improve both the quality of the working environment and increase productivity.*

RECOMMENDATION: IDENTIFY AND STIMULATE RESEARCH AND DEVELOPMENT INITIATIVES THAT INCREASE PRODUCTIVITY WHILE IMPROVING THE QUALITY OF THE WORK ENVIRONMENT.

IMPLEMENTATION:
- Create awards or otherwise provide recognition for successful initiatives that have improved the work environment.
- Fund development proposals that are likely to increase productivity and to improve the quality of the work environment.
- Support basic research.

2.

ISSUE: *Absence of agreement between business and labour may interfere with applications of microelectronics in the work place.*

RECOMMENDATION: ASSIST IN THE RESOLUTION OF BUSINESS/LABOUR ISSUES RELATED TO THE USE OF MICROELECTRONICS IN THE WORK PLACE.

IMPLEMENTATION:
- Collect and disseminate information describing resolutions of business/labour issues related to the use of microelectronics.
- Use existing industry/labour forums to discuss the issues and to look for joint solutions; explore possibility of creating a new consultative body for industry and labour to focus on resolution of these issues.
- Support of basic research.

B. Skills and Knowledge

1.

ISSUE: *Microelectronics will significantly increase the demand for people with specialized skills. Existing teacher training and career counselling methods will have to adjust.*

RECOMMENDATION: DEVELOP TIMELY, RELIABLE AND SKILL SPECIFIC FORECASTS FOR USE IN CAREER CHOICE AND TRAINING PROGRAM DEVELOPMENT. SUPPORT THE DEVELOPMENT OF EDUCATIONAL TRAINING AND COUNSELLING SERVICES THAT MEET THE DEMAND FOR EMERGING JOB-RELATED SKILLS AND KNOWLEDGE.

IMPLEMENTATION:
- Refine existing forecasting of skill needs and career opportunities.
- Refine existing training, educational and counselling services, using microelectronics where appropriate.

2.

ISSUE: *The impact of microelectronics on everyday life, e.g. through electronic banking, teleshopping, etc. will increase the need for new and different computer related abilities and knowledge.*

RECOMMENDATION: SUPPORT COMPUTER LITERACY PROGRAMS BOTH WITHIN AND OUTSIDE TRADITIONAL EDUCATION INSTITUTIONS.

IMPLEMENTATION:
- Increase the commitment of resources to develop computer literacy programs in educational institutions.
- Support the development of computer literacy programs, including methods for delivering these programs to the widest possible range of people.

3.

ISSUE: *Microelectronics technology has the potential to provide the physically handicapped and other needy groups with new opportunities for self-sufficiency and participation in, and contribution to, society.*

RECOMMENDATION: SUPPORT THE USE OF MICROELECTRONICS TO AID SPECIAL GROUPS, E.G. THE PHYSICALLY HANDICAPPED.

IMPLEMENTATION:
- Promote successful applications of microelectronics that aid special groups.
- Support initiatives that promise to use microelectronics to aid special groups.
- Support research to identify new opportunities for using microelectronics to aid special groups.

C. Public Interest

1.

ISSUE: *The increased use of microelectronics for collecting, analyzing and retrieving information may reduce its accessibility to the general public.*

RECOMMENDATION: SUPPORT THE WIDER AVAILABILITY OF MICROELECTRONICS-BASED INFORMATION SERVICES THROUGH EXISTING COMMUNITY INFORMATION CENTRES AND PUBLIC LIBRARIES.

IMPLEMENTATION:
- Fund acquisition by public libraries of equipment for accessing information services.
- Support the development of new information services.
- Regulatory agencies should be encouraged to approve new microelectronic-based information service initiatives.

2.

ISSUE: *Public lack of awareness of the implications of microelectronics technology for everyday life could result in unfounded concerns and missed opportunities.*

RECOMMENDATION: SUPPORT THE DELIVERY OF PUBLIC AWARENESS AND EDUCATION PROGRAMS HIGHLIGHTING OPPORTUNITIES FOR INDIVIDUALS AND BUSINESS.

IMPLEMENTATION:
- Identify target groups for awareness programs.
- Act as a "clearing house" for information and resources.
- Fund the development and implementation of an information and awareness program.

3.

ISSUE: *The spread of microelectronics is likely to produce public concerns that cannot be completely resolved by public awareness programs.*

RECOMMENDATION: RESPOND TO PUBLIC CONCERNS REGARDING THE SOCIETAL IMPACT OF MICROELECTRONICS.

IMPLEMENTATION:
- Monitor public opinion related to the societal impact of microelectronics.
- Develop and implement appropriate measures to deal with legitimate public concerns regarding the societal impact of microelectronics.

INTRODUCTION

I. The broad objective of the Task Force on Microelectronics was to develop policies and programs to ensure that Canada and Ontario would obtain the optimal benefits from current and future developments in microelectronics. Within this, the Task Force was to contribute a better understanding of the nature of the technology as well as how it impacts on business and industry, educational institutions, governments and government agencies, labour and society. In addition to the Executive Summary the report consists of a Background section, the Issues and Recommendations section and finally Appendices.

In conducting its investigation, the Advisory Group set for itself three main tasks: 1) to identify the major areas in which microelectronics has societal impacts, 2) to examine the issues associated with each area of impact, and 3) to recommend appropriate responses to each issue.

The Ministry of Transportation and Communications (MTC) was one of those Ministries asked to assist the Task Force and did so by setting up an Advisory Group which prepared this background paper on societal impacts.

Appendix A is a selected bibliography listing the works which had the greatest impact on this Advisory Group. Appendix B lists the names of individuals and groups who were consulted at various stages in our work. Appendix C is a brief description of the public opinion poll conducted to gauge the interests, hopes and concerns of North Americans regarding the societal impacts of microelectronics.

II. BACKGROUND

The applications of microelectronics will be diverse and pervasive, and the potential societal impacts are significant. The study of these impacts is valuable not only in its own right, but also because societal impacts will be one of the strongest determinants of economic, labour and educational effects.

It should be stated at the outset that this Advisory Group has come away from its research with an optimistic attitude, but not so optimistic as to suggest that governments can ignore the situation. The Group is convinced that goverment has a role to play, in concert with others, in ensuring that the spread of microelectronics technology serves the best interests of society.

In discussing a role for goverment in the context of microelectronics development, a number of key messages were repeated many times by knowledgeable individuals interviewed throughout Canada and the United States. There was agreement on the need for:

- government leadership and innovation
- flexible, long term policy development
- relating initiatives to the inherent strengths of Ontario/Canada

A. Government Leadership and Innovation

Government's ability to deliver social programs, to stimulate industrial development, etc. are founded in large measure on revenue sources that are stable and predictable. Over the decade of the 1970's many events have shaken that foundation and the 1980's offer little or no promise of improvement. These events include the internationalization and interdependence of many countries economies, the growth in the power of the multinationals, the oil "crises" of 1973-'74 and 1979-'80, the evolution of a

remarkably different global economic order etc., and result in government's loosened rein on the forces that bring about change. Whether it can be described, as some do, as the economies of the industrial democracies being in ruins because of policies of OPEC, Japan and the Third World or that these same economies are undergoing a consciously chosen reindustrialization at a pace that minimizes shocks and ensures long-term optimum performance is largely theoretical. What is clear is that given these shifts in economic power and the strong pressures for restraint in public spending, governments should consider productive interventionist models and/or partnership options. As a partner with business and industry, government can enhance its effectiveness in ensuring that its objectives are achieved.

The challenge is to select the mix of interventionist roles and partnerships, given the initiative, that best suits the government's political/social/economic environment. This task is best addressed when implementation strategies are being considered.

B. Flexible Long-Term Policy Development

From a public policy perspective, long-term planning in the case of microelectronics is as important, and perhaps more so, as in many other areas of government responsibility. While relying on the best possible understanding of both technology and society, predictions about their interaction must be made with caution and flexibility. It must be remembered that future technological and social developments are a product of human creativity and inventiveness, both difficult to predict.

The uncertainties and risks associated with technological and social change and interaction argue for governments to maintain a large element of flexibility in their policies and programs.

C. Inherent Strengths of Ontario/Canada

In its discussions inside and outside the Province, the Advisory Group received various comments identifying the following perceived strengths of Ontario:

- the education system in general
- community colleges
- universities
- libraries and community information services
- urban life-styles
- recreational facilities
- cultural amenities
- transportation systems, services and technology
- communication systems, services and technology
- health and medical services and associated technology
- proximity to large markets

The implementation of recommendations should take into consideration the strengths that are inherent in Ontario. For example in any campaign to attract new industry to Ontario the above could be accentuated.

III. ISSUES AND RECOMMENDATIONS

The Advisory Group has identified three areas of societal impact that require the attention of government and its agencies: the work environment, skills and knowledge, and public interest. There are a number of issues associated with each impact area. Each issue is discussed and appropriate responses are recommended, followed by some ideas for implementation.

A. The Work Environment

The potential impacts of microelectronics in the work place are complex and interrelated. Two major objectives of the Ontario government are to increase productivity and to improve the quality of working life. It will be a challenging task to introduce microelectronics in a way that serves both of these objectives. Interrelated issues associated with this impact area are: the potential for microelectronics to displace jobs and the introduction of new factors into the area of negotiation between business and labour.

1. Productivity and the quality of working life

The motives for introducing microelectronics into the work environment are complex. The most obvious benefit is improved productivity, but microelectronics can also reduce stresses and hazards, and make jobs more interesting. One general principle which has wide support is that application of microelectronics must be accepted by those who will be affected. The success of any such application could be as dependent on changes in the quality of working life as on changes in productivity.

In fact, a public opinion poll conducted on behalf of the Advisory Group indicates that Ontarians are optimistic about the impact of microelectronics on the quality of working life. There are positive expectations about the impact of microelectronics on the following job characteristics: interest, hazards, stress, pay and challenge (see Table 1, Appendix C). The optimism regarding pay may reflect employees' expectation that microelectronics will also make them more productive. Table 1 also indicates that Ontarians are not as optimistic in this area as U.S. residents. With the exception of job stress, U.S. residents have even higher expectations than Ontarians about the impact of microelectronics. This relative pessimism adds extra weight to the importance of impacts on the work environment in Ontario. The issue identified above can be stated as follows:
The introduction of microelectronics into the work place could improve both the quality of the working environment and increase productivity.

The role of government in regard to this issue is to encourage developments of mutual long-term benefit to affected employers and employees as well as to suppliers and manufacturers of equipment and systems for the work place. Developments that improve both productivity and quality of working life, implemented in Ontario, can be expected to have considerable export potential. It is recommended that the government:

IDENTIFY AND STIMULATE RESEARCH, DEVELOPMENT AND IMPLEMENTATION THAT INCREASE PRODUCTIVITY WHILE IMPROVING THE QUALITY OF THE WORK ENVIRONMENT.

There are at least three approaches that could be used to implement this recommendation. The first step would be to create awards for new initiatives. A second step would be to fund development and implementation proposals that are likely to increase productivity and to improve the quality of the work environment. These proposals could come from employers, employees, suppliers, manufacturers or any combination of these groups. The last step involves a more long-term approach. While specific initiatives are being identified and funded, it is important to fund basic research in this area, to promote a deeper understanding of why certain initiatives are successful and to lay the groundwork for future developments.

2. The relationship between business and labour

As microelectronics applications increase productivity and improve the quality of working life, a secondary impact could be the displacement of jobs, among which could be many that are inefficient or undesirable. Although the displacement of jobs because of new technology is not exactly a "new" factor in business/labour relations, the spread of microelectronics could accelerate the rate of displacement. Work environments in which technology has not previously produced significant job displacement could also be affected. The adjustments to production processes and to allocation of work assignments because of microelectronic technology could be a source of dispute in business/labour relations.

Of the job impacts presented in the poll, the only one that Ontarians are not optimistic about is job security (see Table 1). Again the contrast with

U.S. expectations suggests a relative pessimism in Ontario. The issue can be stated as follows: *Absence of agreement between business and labour may interfere with applications of microelectronics in the work place*.

The role of government is to support business and labour in their efforts to obtain the optimal benefits from the application of microelectronics in the work place. The record of business/labour relations in this area will have a significant impact on the attractiveness of Ontario as a place to develop and implement microelectronics-based work equipment and systems. It is recommended that government can play a role in: ASSISTING IN THE RESOLUTION OF BUSINESS/LABOUR ISSUES RELATED TO THE USE OF MICROELECTRONICS IN THE WORK PLACE.

A preliminary step in implementing this recommendation would be to collect and disseminate information describing recent resolutions of business/labour issues related to the use of microelectronics. There would be three benefits to this approach: first, it would assist interested parties in understanding the context in which present negotiations are taking place; second, it could provide models of successful resolutions of issues related to microelectronics; and third, it would provide a positive picture of business/labour relations in Ontario to those considering the introduction of microelectronics into the work place, or of expanding or relocating business, in Ontario.

A more long-term approach to this issue would involve the support of basic research in this field. A better appreciation of the impact of microelectronics on business/labour relations could be developed through a

review of for example, the impact on business/labour relations of technology in general so as to promote the positive results achieved as well as to forewarn as to the problem areas. A comparison of government approaches to this issue in different jurisdictions may also be useful.

B. Skills and Knowledge

The impact of microelectronics on job-related skills and knowledge was not discussed in the previous section. The point of discussing this issue in a separate section is that the spread of microelectronics will also have effects on skills and knowledge required outside the work environment. This widespread impact will be significant because people will increasingly be able, or be required, to use intelligent machines in their everyday life. This development will change both how things are done and what things are done; the skills and knowledge that people need will be altered accordingly.

Within this general area of impact, three issues have been identified: one is related to the work environment; a second is related to a particular skill, computer literacy; the third is related to those special groups of people who are likely to benefit most from the spread of microelectronics.

1. Job related skills and knowledge

In the previous section, it was proposed that microelectronics technology has the potential to improve both the quality and the productivity of the work environment. If these improvements are achieved, four related effects are likely to follow, each of which would tend to alter the demand for job-related skills and knowledge.

As intelligent machines increasingly mediate between the worker and the product or service, the ability to operate these new machines will become essential and some previously acquired abilities will become less

important or indeed obsolescent. Second, microelectronic components will allow manufacturers to create new products and services, some of which will compete effectively with existing products and services. This will also change the demand for job-related knowledge and skills. Third, job-related requirements to learn new skills and acquire new knowledge will produce a demand for new systems to support the required training and education. Many of the people involved in the development and delivery of these services will also need to acquire new skills and knowledge, and many existing training professionals will have to adapt to new approaches to training. Finally, this increasingly dynamic work environment will compel people to improve their ability to anticipate which skills and knowledge they will need to further their own careers or indeed to compete effectively in the job market. There will be a resulting increase in the demand for well informed career counselling services. The issue can be stated as follows:

Microelectronics will significantly increase the demand for specialized new knowledge in the work place. Existing teacher/training and career counselling methods will have to adjust or be obsolete.

The role of government is to support business and labour in adapting to these changes. The effectiveness with which Ontarians make this accommodation will be an important factor in the economy of the Province and in the job satisfaction of its residents. It is recommended that government:

DEVELOP TIMELY, RELIABLE AND SKILL SPECIFIC FORECASTS FOR USE IN CAREER CHOICE AND TRAINING PROGRAM DEVELOPMENT. SUPPORT THE DEVELOPMENT OF EDUCATIONAL TRAINING AND COUNSELLING SERVICES THAT MEET THE DEMAND FOR NEW, JOB-RELATED SKILLS AND KNOWLEDGE.

During times of rapid change, there is nothing more valuable than a good prediction. The first step in implementing this recommendation is to anticipate changes in demand for job-related knowledge and skills. Of course, a variety of activities related to this objective are currently taking place, but government could take a more active role in stimulating, supporting and integrating these activities.

The increasing need for workers to acquire new skills and knowledge will enhance the value of services that effectively train, educate, and provide career counselling. Fortunately, the new technologies that are responsible for these changes can also be applied to the task of helping people adapt. As the demands for future job related skills and knowledge are better understood, it will be possible to modify existing training, educational and counselling services, using microelectronics where appropriate.

The use of microelectronics in the delivery of these services has the additional advantage of providing a stimulus to those involved in the design and manufacture of the required hardware, software and courseware. The local market for these products and services could also provide a base for exports. A failure to support this kind of activity would leave the Ontario market open to imported systems and services. In addition to the economic and employment impacts, microelectronic-based course content would be added to Ontario's long list of imported cultural products.

2. Computer literacy

Many of the impacts of microelectronics on the work environment can be expected to find parallels in the wider context of everyday life. This broad impact is especially likely in the area of skills and knowledge.

Microelectronics technology promises opportunities to work in different ways; it will also offer new ways to learn, communicate, move, play, shop, and express ourselves creatively. To take full advantage of these opportunities, three challenges will have to be met: acquire new skills and knowledge, develop the related system for training and teaching, and forecast, and prepare for, future opportunities. The issue can be stated as follows:

The impact of microelectronics on everyday life, e.g. through electronic banking, teleshopping, etc. will increase the need for new and different abilities and knowledge.

Computer literacy is the ability to interact capably, confidently and comfortably with equipment incorporating some form of artifical intelligence, i.e. computers or the ability to make effective use of microelectronics in ones everyday life. The role of government is to support institutions that advance this goal, but separate attention should be given to educational institutions, because their mandate is especially relevant to the task, and because education is a Provincial responsibility. It is recommended that government:

SUPPORT COMPUTER LITERACY PROGRAMS BOTH WITHIN AND OUTSIDE TRADITIONAL EDUCATION INSTITUTIONS.

Implementation of this recommendation will be direct when acting through government institutions and more supportive in other cases. The Ministry of Education in Ontario has already begun initiatives in this area and it is recommended that the government of Ontario increase its commitment of resources to develop computer literacy programs in educational institutions. In this case it is recommended that support be given

to the development of computer literacy programs, including methods for delivering these programs to the widest possible range of people.

There are two kinds of benefits that can be expected from programs that effectively raise computer literacy in Ontario. One benefit is that computer literate people will be better able to take advantage of the opportunities offered by microelectronics. Secondly a computer literate population in Ontario would also provide a more receptive climate for the diffusion of microelectronics and a local market that could help the local microelectronics industry compete internationally.

3. Special groups

The previous two issues in the section focus on the need to help the average resident of Ontario develop the new skills and knowledge needed to adapt to the spread of microelectronics. The recommendations assume that the typical Ontario resident is reasonably well adapted to the present environment and needs help because microelectronics will change that environment, for better or worse. For some residents of Ontario, microelectronics technology is more than a factor promising new risks and opportunities, it represents a chance to share opportunities taken for granted by the average Ontarian.

The most obvious case of such a special group is the physically handicapped. For example, television caption systems allow the deaf and hard-of-hearing to fully enjoy TV programs for the first time. Other microelectronics-based systems allow those with communication, locomotion, or coordination disabilities to become more self-reliant and to become productive members of the Ontario work force. Microelectronics can provide important benefits to the disabled, but it also offers

opportunities to other groups with special needs, e.g. the elderly, members of minority language groups, and remote populations. It is important to investigate the full range of groups that can benefit from the use of microelectronics. The issue can be stated as follows:

Microelectronics technology has the potential to provide the physically handicapped and other needy groups with previously unavailable and/or impossible opportunities for self-sufficiency and participation in and contribution to society.

In concert with others, government has always played an active role in identifying disadvantaged groups and providing them with appropriate assistance. In the context of this report, the role of government is to ensure that microelectronics technology is effectively used as a part of this process. It is recommended that government:

SUPPORT THE USE OF MICROELECTRONICS TO AID SPECIAL GROUPS, E.G. THE PHYSICALLY HANDICAPPED.

In many cases, the first step in implementing this recommendation has already been taken; many disadvantaged groups have been identified and progress has been made in understanding their special needs. For some groups, appropriate initiatives have already been taken to apply microelectronics to these special needs. Implementation would start with actions to promote and support the development of applications of microelectronics that aid special groups. A careful study of successful programs of this type will provide a good basis for the next step: to support initiatives where microelectronics are used to aid special groups. A long term approach to this issue is also required. Government should be prepared to support research to identify new opportunities for using microelectronics to aid special groups.

The benefits of the actions proposed above will depend on the particular combination of group and application, but the benefits need not be for the group alone. Consider, for example, a system designed to help minority language groups improve their communication skills. The benefits to the group are obvious, but the successful development of such a system would also help these groups make better contributions to their work place, their community and society in general. Using microelectronics to bring improved communications, social and cultural services to remote populations could be part of existing or future regional development programs. Of course, any successful application of microelectronics in the resolution of the problems of special needy groups could provide a base for exports and the capturing of a share of the global market.

C. Public Interest

The issues that remain are not related to any particular impact area; rather they are part of the general pattern of change that microelectronics is likely to produce.

The first issue is related to the fact that microelectronics will facilitate, indeed encourage, the production, storage and analysis of large amounts of information. Access to that information will also tend to involve the use of microelectronics. The second issue is related to societal change as a general phenomenon and the need for public awareness of the changes that microelectronics is producing and will produce. The third issue is related to the public reaction to these changes, expressed in the form of hopes and concerns, and the need for appropriate responses.

1. Public access to information services

The spread of microelectronics is likely to increase the importance of information because of the ease with which vast and complex amounts of information can be collected, stored, analyzed and retrieved. If, as is likely, this development involves extensive use of microelectronics, the technology that supports the creation of this information handling capacity could also constitute an impediment to its use by the general public. Initially at least, only large organizations will have the resources required to take full advantage of this development. This barrier can be partially overcome through the computer literacy programs recommended in the previous section, but there remains a problem of access.

Private interests may not coincide with the public interest in regard to access, with serious consequences as the result. The danger is in accelerating the creation of an information gap in society where those who are information poor are increasingly excluded from the advantages and benefits access to information confers.

That this issue is of public concern is indicated by response to a survey question that asked Ontarians to anticipate whether "greater use of computers to handle information will...allow information to be controlled by more people or allow information to be controlled by fewer people"? Significantly more people (52%) chose the former alternative than the latter (37%) with the remainder expressing no opinion. The issue can be stated as follows:

The increased use of microelectronics for collecting, analyzing and retrieving information may reduce its accessibility to the general public.

The role of government in regard to this issue is complex, but an analogy with printed information is instructive. Government support for public libraries

and community information centres ensures that the time and money required to obtain printed information is not an insurmountable barrier to the general public. Selective support is also available from government for publications that are expected to be of general public benefit. It is recommended that government:

SUPPORT THE AVAILABILITY OF MICROELECTRONICS-BASED INFORMATION SERVICES THROUGH EXISTING COMMUNITY INFORMATION CENTRES AND PUBLIC LIBRARIES.

Implementation of this recommendation follows the pattern of support that government has established in regard to printed information. With the objective of greater availability to the general public, government should fund acquisition by public libraries of equipment for accessing information services. Government should also be prepared to support the development of new information services that are likely to avoid creation of an information gap in society but require funding.

Microelectronic-based information services will be provided in a more complex regulatory environment than that of printed information. One important difference is the likely involvement of broadcasters, telecommunications common carriers and the cable TV industry in addition to the traditional publishers. There is a risk that the regulatory environment in which these industries operate will constrain the development of new information services. To counteract this tendency the relevant regulatory agencies should be encouraged to approve new microelectronic-based information service initiatives by those industries. There should be no restriction on the development and delivery of information services in a democratic society.

There are three benefits of generally available, microelectronic-based information services. First, being able to access useful information will increase the motivation and the opportunity to become computer literate. Second, the availability of these new services will make for a better informed public. Third, a wide market for information services will provide a stimulus to the microelectronics industry.

2. Public awareness and education

The proliferation of information is just one of the expected societal impacts of the spread of microelectronics but it is clear that developments in this area must continue to be monitored. The need for further study is especially important given the general level of public awareness. According to the survey referred to above, only nine percent (9%) of Ontarians say they "know a lot" about microelectronics. This level of awareness may not be high enough to ensure the optimal societal benefits of microelectronics. The issue can be stated as follows:
Public lack of awareness of the implications of microelectronics technology for everyday life could be harmful because of unfounded concerns and missed opportunities.

Improved public awareness is a goal shared by many, including: business, labour, educational institutions, community service groups, religious organizations, and government. The role of government is to act in concert with others to help the general public anticipate the societal impacts of microelectronics. It is recommended that government:

SUPPORT THE DELIVERY OF PUBLIC AWARENESS AND EDUCATION PROGRAMS HIGHLIGHTING OPPORTUNITIES FOR INDIVIDUALS AND BUSINESS.

Implementation of this recommendation requires close coordination with others sharing the goal of public awareness. As a preliminary activity, government should identify target groups for the awareness programs.

As part of its activity to continue monitoring the societal impacts of microelectronics, government should share the fruits of this labour with the public and act as a "clearing house" for information and resources.

As particular impacts and target groups are clearly identified, government should also fund the development of information and awareness programs designed to raise public awareness.

There are three main benefits of improved public awareness: an informed public is more likely to benefit from the spread of microelectronics, the industry will encounter less of the resistance to change that is based on ignorance and confusion, and political decisions related to microelectronics will be more democratic because public opinion will be better informed.

3. Public Concerns

Any development as diverse and pervasive as the spread of microelectronics is likely to produce some public apprehension. Public awareness and education programs will provide some assurance, but these general programs will not resolve all public concerns related to the societal impact of microelectronics.

The nature of current public concerns is indicated by responses to a question on the previously mentioned survey of public opinion. Respondents were given a list of thirteen issues related to microelectronics and were asked to indicate which were the five most

important. The issue chosen most often was privacy and confidentiality of personal information. Sixty-three percent (63%) of respondents picked that issue as one of the five most important. The next three most important issues were accuracy of billing, control of information and job security (see Table 2, Appendix C). The general issue identified in this section can be stated as follows:
The spread of microelectronics is likely to produce public concerns that cannot be resolved by general public awareness programs.

The role of the government is to collaborate with appropriate parties to resolve public concerns regarding the societal impacts of microelectronics. It is recommended that government:

RESPOND TO PUBLIC CONCERNS REGARDING THE SOCIETAL IMPACT OF MICROELECTRONICS.

Given the potential diversity of these concerns, it is unlikely that any single implementation strategy will be appropriate for all concerns. Nevertheless, two activities would appear to be useful as preliminary steps. To take appropriate action, it is necessary to assess the specific nature of these concerns. The first step, therefore, would be to monitor public opinion related to the societal impact of microelectronics. The poll conducted by the Advisory Group is an exploratory step in that direction. Once public concerns are identified and reasonably well understood, a second step is to dispell misinformation and exaggerated concerns. This activity could involve support of existing public awareness and education programs, but additional government initiatives may be necessary.

Although these preliminary steps will resolve many public concerns, others will simply be clarified and will ultimately require a response. In this case, the third step would be to consider appropriate measures to deal with legitimate public concerns regarding the societal impact of microelectronics.

One example of the Ontario Government's response to similar concerns has been the establishment of commissions of inquiry, for example the Williams Commission and the Krever Commission.

Depending on the nature of the public concern, other approaches may be considered more appropriate, and it would be useful to examine initiatives taken in other jurisdictions. In the case of the personal privacy issue, for example, consideration should be given to existing legislation in the U.S., Sweden, France and West Germany.

If the public knows that the government will respond to legitimate concerns in this area, they will be more likely to face, with confidence, the rapid societal changes that microelectronics technology is likely to produce.

APPENDIX A: SELECTED BIBLIOGRAPHY

Arroyo Galan, Luis, "Building the Future, Not Guessing It," Telecommunications Journal, Vol. 48 - 11/1981, pp. 85-87.

Barron, Iann and Curnow, Ray, The Future with Microelectronics - Forecasting the Effects of Information Technology, London, Frances Pinter Ltd., 1979.

Bell, D., "Communications Technology - for Better or Worse," Harvard Business Review, May-June 1979.

Bell, Daniel, The Coming of Post Industrial Society: A Venture in Social Forecasting, Peregrine Books (Penquin Books Ltd.) 1976.

Berliner, H.I. and Golland, M., "Mini-computers for the Uninitiated," Management Focus, May-June, 1980.

Bernstein, Jeffrey, "The Micro-economics of Information: Structural and Legal Aspects," Gamma, Paper #1, Apr. 15, 1979.

Bird, Emma, "Future Work Patterns Resulting from Advances in Telecommunications," Telecommunications Journal, Vol 48 - 11/1981, pp. 77-84.

Boehm, B. and Sackman, H., Planning Community Information Utilities, Montvale, New Jersey, 1972.

Bork, A., "Stand-alone Computer Systems - Our Educational Future," Journal of Educational Technology Systems, Vol. 7(3), 1978-79.

Bork, Alfred, "Will Computers Replace Books in American Education?" Forum Fifty, Vol. VI, No. 12, Dec. 1978.

Bork, Alfred and Franklin, Stephen, D. "The Role of Personal Computer Systems in Education," AEDS Journal, Vol. 13, No. 1, Fall 1979.

Brooks, Richard, "Japan Sets Next Target," The Sunday Times, 29 November, 1981.

Buchanan, Lillian, "Organized Labour and Technological Change," Women's Bureau, Labour Canada, March 1981.

Canadian Science Council, "The Impact of the Microelectronics Revolution on Work and Working," Proceedings of a Workshop, Science Council of Canada, Ottawa, Ontario, July, 1980.

Cohen, D., "A Call to Arms," In Search: The Canadian Communications Quarterly, Vol. 7(2), Spring 1980.

Cordell, Arthur, J., "Models of an Information Society," Paper given at Canadian Communications Association Annual Meeting, June 1, 1980.

Dertouzos, M.L. and Moses, J., editors, The Computer Age: A Twenty Year View, Cambridge, Mass., MIT Press, 1979.

de Sola Pool, Itheal, "The Productivity of Information," Intermedia, Vol. 8, No. 4, July, 1980.

Dordick, H., Bradley, H., Nanus, B. and Martin, M., "Network Information Services," Telecommunications Policy, (September 1979), pp. 217-234.

Dyson, W., Glossop, R. and Maxwell, Grant, "Some Reflections on the Evolution of Canada's Political Economy and its Implications for Families and Communities," Vanier Institute of the Family, October, 1978.

Dyson, William A., "People are the Policy," Presented at the XXth International Conference on Social Welfare, Hong Kong, July, 1980.

Eglin, Roger and Barber, Lionel, "Japan's Rising Sun in Britain," The Sunday Times, 6 December, 1981, pp. 56, 57.

Federal Republic of Germany, Law on Protection against the Misuse of Personal Data in Data Processing (Federal Data Protection Law - BDSG), of the 27th January 1977. Bilingual edition edited by Gesellschaft für Datenschutz und Datensicherung e.V., Bonn. Frankfurt/Main: Fritz Knapp Verlag, 1977.

Fincher, Jack, "Computers are Kid Stuff," Next, Vol. 1, No. 1, March/April, 1980.

Finn, E.D., "The Labour Perspective: Unions Face a Difficult Battle in Keeping Jobs," CIPS Review, Jan., Feb. 1980, pp. 24-26.

Freese, Jan, "Swedish Data Policy," Svenska Institutet, No. 212, March, 1979.

Gardiner, W. Lambert, "Public Acceptance of the New Information Technologies: The Role of Attitudes," Gamma, Paper No. 1-9, April, 1980.

Gennard, John, "Job Security and Industrial Relations," Paris, OECD Publications, 1979.

Gershuny, Jonathan I., After Industrial Society? The Emerging Self-service Economy, Humanities Press, New Jersey, 1978.

Giraud, Alain, "Human Factors and Social Research," Telecommunications Journal, Vol. 48 (111/1981), pp. 137-139.

Gotlieb, Calvin, C., "Computers - A Gift of Fire," Information Processing 80, S.H. Lavington (ed.), North Holland Publishing Company, OIFIP, 1980.

Gotlieb, C.C., Computers in the Home, Institute for Research on Public Policy, Montreal, 1978.

Gotlieb, C.C. and Zeman, Z.P., "Towards a National Computer and Communications Policy: Seven National Approaches," Report prepared for the Canadian Department of Communications, by the Institute for Research on Public Policy, Toronto, 1980.

Goldmark, P.C., "Communications and the Community," Scientific American, Vol. 227(3), 1963.

Grant, J., "The Key to Declining Productivity," Canadian Information Processing Society Review, Vol. 4(1), 1980.

Green, R., Coombs, R. and Holroyd, K., The Effects of Microelectronics Technologies on Employment Prospects, A Case Study of Tameside, Gower Publishing, 1980.

Gruhn, A.M. and Hohl, A.C., "A Research Perspective on Computer-assisted Office Work," IBM Systems Journal, Vol. 18(3), 1979.

Hagmann-Petersen, S., "Socio-economic Aspects as Result of the 1977 E.C.E. Seminar on Industrial Robots and Programmable Logical Controllers," Proceedings, 7th International Symposium on Industrial Robots, Tokyo, 1977.

Hampson, Anthony H., "Strategic Management Approaches," Financial Post Seminar on Strategic Management, Toronto, Dec., 1981.

Handy, Charles, The Future of Work - A View of the Problems and Possibilities, Oxley, Windsor, 1980.

Harris, Louis and Westin, Alan F., "The Dimensions of Privacy," A Report prepared for Sentry Insurance (Stevens Point, WI).

Hasegawa, Yukio, "Industrial Robot Applications for Improving the Quality of Working Life," Proceedings, 7th International Symposium on Industrial Robots, Tokyo, 1977.

Haslam, G., "Fear and Opportunity in the Information Marketplace," In Search, Spring, 1980.

Hondius, Frits, Emerging Data Protection in Europe, New York, American Elsevier Publishing Co. Inc., 1975.

Howkins, J., "The Information Societies," In Search, Spring, 1980.

Ingber, Dina, "Computer Addicts," Science Digest, (July 1981), pp. 88-114.

Jecchinis, C.A., "The Impact of Microelectronic Technology on Employment: A Survey of Current Research Studies in Selected West European Countries," Ontario Ministry of Labour, July, 1980.

Kling, R., "Electronic Fund Transfer Systems and Quality of Life," AFIPS Conference Proceedings, Vol. 47, 1978 National Computer Conference, 5-8 June, 1978, Anaheim.

Kling, R., "Models for the Social Accountability of Computing," Telecommunications Policy, September, 1980.

Kling, R., "Value Conflicts and Social Choice in Electronic Funds Transfer System Developments," Commun. ACM, Vol. 21, No. 8, pp. 642-57, Aug., 1978.

Kling, Rob, "Social Analyses of Computing: Theoretical Perspectives in Recent Empirical Research," Computing Surveys, Vol. 12, No. 1 (March 1980), pp. 62-110.

Krever, The Honourable Mr. Justice H., "Ontario Commission of Inquiry into the Confidentiality of Health Information," Queen's Printer for Ontario, Vol. 1, September, 1980.

Leontief, Wassily, "New Technology and Employment Opportunities," Proceedings of a Conference on the Impact of Micro-electronic Technology on the Work Environment, Labour Canada, Ottawa, (March, 1981), pp. 82-86.

Madden, John, C., "Micro-electronics and the Work Environment," Proceedings of a Conference on the Impact of Micro-electronic Technology on the Work Environment, Labour Canada, Ottawa (March, 1981), pp. 110-119.

McLean, M.J., The Impact of the Microelectronic Industry on the Structure of the Canadian Economy, Institute for Research on Public Policy, Montreal, 1979.

Melvyn, Peter, "Microelectronics and Industrial Relations," Proceedings of a Conference on the Impact of Micro-electronic Technology on the Work Environment, Labour Canada, Ottawa, (March, 1981), pp. 7-12.

Menzies, Heather, Women and the Chip, Institute for Research on Public Policy, Montreal, 1981.

Mersich, D.A., (a series of articles on computers and the law), Canadian Datasystems, October, 1978 - June, 1980.

Mirabelli, Alan et al, "Communications: Technology ... and the Human Process," Vanier Institute of the Family, Ottawa, November, 1978.

Molnar, Andrew R., "The Next Great Crisis in American Education: Computer Literacy," Educational Technology Systems, Vol. 7(3), 1978-79, pp. 275-285.

Mowshowitz, Abbe, The Conquest of Will: Information Processing in Human Affairs, Addison, Wesley, 1976.

Nanus, B., Wooton, L. and Burko, H., "The Social Implications of the Use of Computers Across National Boundaries," American Federation of Information Processing Societies, 1973.

Nanus, Burt, "Business, Government and the Multinational Computer," Columbia Journal of World Business (Spring, 1978), pp. 19-26.

National Board for Science and Technology, Microelectronics, The Implications for Ireland, 1981.

Nora, S. and Minc, A., Report on the Computerization of Society, Cambridge, Mass., MIT Press, 1980.

Norman, Colin, "Microelectronics at Work: Productivity and Jobs in the World Economy," Worldwatch Paper 3, Worldwatch Institute, Washington, D.C., October, 1980.

"OECD, The Usage of International Data Networks in Europe (Information Computer Communications Policy)," A Report of the Organization for Economic Cooperation and Development, Paris, 1979.

Okamatsu, Sozaburo, "Influence of Micro-electronics on the Economy," Proceedings of a Conference on the Impact of Micro-electronic Technology on the Work Environment, Labour Canada, Ottawa, March, 1981.

Pappert, S., Mindstorms: Children, Computers and Powerful Ideas, Basic Books, New York, 1980.

Parker, Donn B., "Computer Crime: The Great Unknown," Computer Data (June, 1981), pp. 55, 56, 58.

Peitchinis, S., "The Impact of Technology," Canadian Information Processing Society Review, Vol. 4(1), 1980.

Peterson, L., "Social Dangers in the Information Revolution," In Search: The Canadian Communications Quarterly, Vol. 7(1), Winter, 1980.

Rada, Juan, The Impact of Microelectronics. A Tentative Appraisal of Information Technology, ILO Press, 1980.

Rathenau, G.W., The Social Impact of Microelectronics, Government Publishing Office, The Hague, 1980.

Research Branch, Ontario Ministry of Labour, "Electronic Surveillance: A Discussion Paper," Report No. 21, 1979.

Rule, J.B., "Electronic Funds Transfer and Federal Privacy Policy," Jurimetrics J., Vol. 18, No. 1, pp. 56-79, Fall, 1977.

Rule, J.B., "Preserving Individual Privacy in an Information Oriented Society," in: L.J. Hoffman, ed., Computers and Privacy in the Next Decade, New York, Academic Press, 1980.

Russell, R.A., "The Electronic Briefcase: The Office of the Future," Institute for Research on Public Policy, Montreal, 1978.

Salton, Gerard, "A Progress Report on Information Privacy and Data Security," Journal of the American Society for Information Science, (March, 1980), pp. 75-83.

Schafer, Joachim, "The West German Perspective: West Germany Offers Some Interesting Alternatives," CIPS Review, Jan., Feb., 1980, pp. 27-30.

Schwartz, P., Teige, P. and Harman, W., "In Search of Tomorrow's Crises," The Futurist, Oct., 1977, pp. 269-278.

Sindell, Peter S., "Public Policy and the Canadian Information Society," Gamma, Paper No. 4 Apr., 1979.

Skjeseth, Helge, "Industrial Democracy in Norway," Proceedings of a Conference on the Impact of Micro-electronic Technology on the Work Environment, Labour Canada, Ottawa, March, 1981.

Smith, Joy Selby, "Technological Change in Australia: The Report of the Committee of Inquiry into Technological Change in Australia 1980," Proceedings of a Conference on the Impact of Micro-electronic Technology on the Work Environment, Labour Canada, Ottawa, March, 1981.

"Technological Change and Jobs," Canadian Labour Congress, 1978.

Tengelin, Ulrika, "Effects of Computerization on Employment and Working Environment: Labour Market Implications for Women," Proceedings of a Conference on the Impact of Micro-electronic Technology on the Work Environment, Ottawa, March, 1981.

Thompson, G.B., "Memo from Mercury: Information Technology is Different," Institute for Research on Public Policy, Montreal, 1979.

Thompson, G.B., "Technology and the Information Society," In Search, Spring, 1980.

Toffler, A., The Third Wave, William Morrow, March, 1980.

Turkle, S., "Computer as Rorschach," Society, January-February, 1980.

Ullman, A.A., "Triumphs of Mini-computers Have Only Begun," Management Focus, May-June, 1980.

UNESCO, "Strategies and Policies for Informatics: Final Report," SPIN Conference 1978 SC/MD/63 Paris, 30 March, 1979.

Valaskakis, Kimon, "The Information Society: The Issues and the Choices," Gamma Project, Montreal.

Vanier Institute of the Family, "Exploring Work and Income Opportunities in the 1980's," Proceedings of a VIF Seminar, Oct., 1979.

Vinge, P.G., "Experiences of the Swedish Data Act," Federation of Swedish Industries, Sept., 1975.

Vinge, P.G., "Swedish Data Act," Federation of Swedish Industries, Dec., 1973.

Vogel, David, "Business Without Science," Science Digest, (July, 1981), pp. 16, 111.

Walling, Victor C., Thomas, Thomas C. and Larson, Meredith A., "Educational Implications of In-home Electronic Technology," SRI International Research Memorandum-33, May, 1979.

Westin, A.F. ed., Information Technology in a Democracy, Cambridge, Mass., Harvard University Press, 1971.

Wiener, N., The Human Use of Human Beings: Cybernetics and Society, Boston, Houghton Mifflin, 1954.

Wilby, Peter, "The Belfield Experiment," Sunday Times Weekly Review, 29 March 1981, pp. 33, 35.

Williams, D.C., "Ontario Commission on Freedom of Information and Individual Privacy, Public Government for Private People," Queen's Printer for Ontario, Vol. 1, August, 1980.

Wills, Russell, "Research and Development in the Information Sector of the Canadian Economy," Gamma, Paper #6 April, 1979.

"Women, Technology and the Development Process," International Labour Office, ILO/W.4/1978.

Women's Bureau, Proceedings of a Conference on the Impact of Micro-electronic Technology on the Work Environment, Labour Canada, Ottawa, March, 1981.

Zeman, Z. and Russel, R., "The Chip Role," Canadian Information Processing Society Review, Vol. 4(1), 1980.

APPENDIX B: CONSULTANTS AND RESEARCH STAFF

The research staff of the Advisory Group on Societal Impacts drew on the expertise of a number of individuals and groups. These contacts were useful in finding a strategy for investigating this complex area, identifying issues and developing recommendations.

The group and individuals consulted were as follows:

J. Botkin, Consultant
Cambridge, Massachusetts

A. Cordell, Administrator
Science Council of Canada
Ottawa, Ontario

Creative Computing, Publishers
David Ahl
George Blank
Morris Plains, New Jersey

Croton Research Group, Consultants
K. Laudon
A. Mowshowitz
Croton-on-Hudson, New York

D. Dimancescu, Consultant
Cambridge, Massachusetts

The Gamma Group, Consultants
P. Sindell
K. Valaskakis
Montreal, Quebec

D. Godfrey, Academic
Creative Writing Department
University of Victoria
Victoria, British Columbia

C.C. Gotlieb, Academic
Department of Computer Science
University of Toronto
Toronto, Ontario

R. Kling, Academic
Department of Information
and Computer Science
University of California
Irvine, California

The Logo Group, Academics
H. Abelson
J. Bamberger
A. Dissessa
Massachusetts Institute of Technology
Cambridge, Massachusetts

R.S. McLean, Academic
Department of Measurement,
Evaluation and Computer Applications
Ontario Institute for Studies in
Education
Toronto, Ontario

D.A. Mersich, Attorney and Consultant
Don Mills, Ontario

B. Nanus, Academic
Centre for Futures Research
University of Southern California
Los Angeles, California

W. Olivier, Academic
Ontario Institute for Studies in
Education
Department of Measurement,
Evaluation and Computer Applications
Toronto, Ontario

S.G. Peitchinis, Academic
Department of Economics
University of Calgary
Calgary, Alberta

W. Reno, Labour Representative
United Food and Commercial Workers Union
Don Mills, Ontario

J.B. Rule, Academic
Department of Sociology
State University of New York
Binghamton, New York

SRI International, Consultants
R.C. Carlson
O. Goldfarb
G. Kelton-Fogg
P. Schwartz
P. Teige
V. Walling Jr.
Menlo Park, California

H. Sackman, Academic
Business Information Systems
California State University
Los Angeles, California

S. Turkle, Author and Consultant
New York, New York

The Vanier Institute of the Family,
Consultants
W. Dyson
R. Glossop
A. Mirabelli
Ottawa, Ontario

R. Walker, Manufacturer and Consultant
Los Altos, California

Z.P. Zeman, Consultant
Institute for Research on Public Policy
Montreal, Quebec

The research staff was drawn from the Communications Policy Branch of the Ontario Ministry of Transportation and Communications, and consisted of:

J.D. Long
J.A. O'Flynn and
R.M. Rosenbaum

APPENDIX C: POLL OF PUBLIC OPINION RELATED TO THE SOCIETAL IMPACTS OF MICROELECTRONICS

Over 2500 adult residents of Ontario and the United States participated in face-to-face interviews as part of omnibus polls conducted in February and March of 1981. All respondents were asked standard demographic questions as well as a series of questions about how the future spread of microelectronics technology might affect them and society in general.

The samples, designed to be representative of the general population, consisted of 1085 residents of Ontario and 1589 residents of the United States. In both countries, results were weighted to eliminate biases caused by under representation of certain "difficult to reach" population groups.

In both countries, the same questions were asked at about the same time of year, similar sampling techniques were used and the interview techniques were similar. It is therefore assumed that any differences in response reflect different attitudes in the two countries.

TABLE 1: Expectations of Ontario and U.S. residents regarding the impact of microelectronics on their jobs.

IMPACT	PERCENT OF RESPONDENTS AGREEING	
	ONTARIO	U.S.
MORE INTERESTING	49	55
MORE BORING	26	14
LESS HAZARDOUS	35	41
MORE HAZARDOUS	18	11
LESS STRESSFUL	45	46
MORE STRESSFUL	26	23
HIGHER PAYING	39	43
LOWER PAYING	16	13
MORE CHALLENGING	45	48
LESS CHALLENGING	31	21
MORE SECURE	28	33
LESS SECURE	34	27

NOTE 1:

The "No Change" and "Don't Know" responses for each impact added to above %'s will total 100%.

TABLE 2: Ontario residents' judgments of the five most important societal issues related to microelectronics.

ISSUE	PERCENT OF RESPONDENTS WHO JUDGE ISSUE AS IMPORTANT
PRIVACY AND CONFIDENTIALITY	63
ACCURACY OF BILLING	46
CONTROL OF INFORMATION	45
JOB SECURITY	44
JOB PAY	38
JOB SAFETY	38
COMPUTER CRIME	34
COST OF HOME EQUIPMENT	30
INFORMATION ABOUT WHAT ORGANIZATIONS ARE DOING	29
JOB STRESS	28
JOB INTEREST	27
JOB CHALLENGE	25
COMPLEXITY OF HOME EQUIPMENT	18

TABLE 3: Questionnaire administered as part of omnibus polls in Ontario and the United States.

ASK EVERYONE

HAND CARD

Please look at this card and read it carefully.

In recent years, electronics have changed our world. Many of the machines we use now have extra buttons and dials, memories, and communication links to other machines. Some of these machines can perform complex tasks automatically, and a few seem to be able to think.

Imagine that, perhaps surprisingly soon, electronics will make familiar machines more efficient and more automatic. Also imagine that electronics will soon make available some machines that are quite different from any you have seen. In the questions that follow, we ask how this new technology will affect you; how these changes might improve your life; how they might make it worse.

The first group of questions deals with your work in the future.

1. Are you currently employed outside of the home full-time, part-time or not at all?

   FULL-TIME
   PART-TIME
   NOT AT ALL - SKIP TO Q.3

TABLE 3 cont'd

ASK ALL "FULL-TIME" AND "PART-TIME"

2. In places where people work, there could be more computers, robots, intelligent typewriters, electronic calculators, TV display screens, etc. If there is more of this kind of equipment soon where you work, we would like you to think for a moment how it will affect your job.

   I am going to hand a number of cards to you one at a time, listing some of the things that might happen because of these changes. Please read the card through first, and then I will ask you which of each of the possible alternatives you believe will be true for you. SHUFFLE CARDS AND HAND TO RESPONDENT ONE AT A TIME.

   Will your job be:

   a. More interesting?
      More boring?

      ABOUT THE SAME
      CAN'T SAY

   b. Less hazardous to your health
      More hazardous to your health

      ABOUT THE SAME
      CAN'T SAY

   c. Less stressful?
      More stressful?

      ABOUT THE SAME
      CAN'T SAY

   d. Higher paying?
      Lower paying?

      ABOUT THE SAME
      CAN'T SAY

   e. More secure?
      Less secure?

      ABOUT THE SAME
      CAN'T SAY

   f. More challenging?
      Less challenging?

      ABOUT THE SAME
      CAN'T SAY

TABLE 3 cont'd

ASK EVERYONE

3. The second group of questions deal with your home in the future.

New electronic technology could be used in more of the equipment people use at home. Of course, the effect of this equipment on you personally will depend on whether you have it in your home and on how well it works.

HAND CARD

Here is a card listing six different categories of equipment that could be made available soon.

Please read through the different types and then I'll ask you, for each category, whether you think you will or will not buy them, and if so, why.

The response categories are listed on this card. Just indicate the number opposite the response that fits you best.

HAND CARD

WON'T BUY
WILL NOT NEED

WON'T BUY
TOO EXPENSIVE

WON'T BUY
TOO COMPLICATED

WON'T BUY
WILL NOT CHANGE LIFE

WILL BUY
WILL CHANGE LIFE

DON'T KNOW

a. Improved home appliances and tools allowing you to do better work with less effort and new jobs you previously couldn't do.

b. Improved home entertainment equipment giving you better and more varied programs.

c. Equipment that provides better information about your world.

d. Equipment that makes your life and property more secure.

e. Equipment that makes it easier to learn skills useful in school, at jobs or at home.

f. Equipment that makes it easier to communicate with friends and family.

TABLE 3 cont'd

Increased amounts of information about individuals is being collected and stored by business and institutions such as schools, hospitals, and governments. Although some of the information is now handled by computers, this could increase dramatically in the near future.

4. I am going to hand some cards to you one at a time each with a pair of opposing statements.

   At the top of each card is a scale showing at one end complete agreement with the left-hand side statement and at the other end complete agreement with the right-hand side statement. I'd like you to read each pair of statements and tell me what point on the scale best represents your opinion. SHUFFLE CARDS AND HAND TO RESPONDENT ONE AT A TIME.

   Greater use of computers to handle information will ...

   a. Produce more mistakes and confusion.
      OR
      Produce fewer mistakes and less confusion.

   b. Make it easier to find out what organizations are doing.
      OR
      Make it more difficult to find out what organizations are doing.

   c. Protect the privacy and confidentiality of personal information.
      OR
      Reduce the privacy and confidentiality of personal information.

   d. Allow information to be controlled by more people.
      OR
      Allow information to be controlled by fewer people.

TABLE 3 cont'd

HAND CARD

5. I am now going to hand you a card that has a number of issues associated with the introduction of micro-electronics. From this card, I would like you to choose the 6 issues that you personally feel are most important. Please read all issues before responding. Just give me the letters beside the statements you choose.

   a. Privacy and confidentiality of personal information.

   b. Accuracy of computerized billing.

   c. Opportunities for computer crime.

   d. Information about what organizations are doing.

   e. Number of people controlling information.

   f. Cost of home equipment and appliances.

   g. Complexity of home equipment and applicances.

   h. Interest value of jobs.

   i. Safety of jobs.

   j. Stress associated with jobs.

   k. Security of employment.

   l. Challenge of jobs.

   m. Pay and wages for jobs.

TABLE 3 cont'd

IF "PRIVACY OF PERSONAL INFORMATION" CHOSEN IN Q.5, ASK:

6. In response to the last question, you expressed concern about the effect of micro-electronics on the privacy of personal information. Looking ahead for the next five years, do you think that your privacy will be invaded or seriously disturbed by: ROTATE ORDER

Any of your neighbours?
Anyone from work?
A caller at your home?
Anyone telephoning you?
Anything else you have received in the mail?
The publication of information about you on radio, TV, in newspaper?
Anyone who could interfere with your mail?
A credit rating agency?
A bank?
A computer or databank?
A department store?
Insurance companies?
A hospital, medical laboratory, or medical center?
A school, community college or university?
Local government?
Provincial government?
Federal government?
NONE OF THE ABOVE

ASK EVERYONE

7. We have just asked you a number of questions about micro-electronics technology. Of course, this topic is more familiar to some people than to others. Which one of the following best describes what you personally know about micro-electronic technology? READ LIST ....

I know a lot about micro-electronic technology through direct experience in my job, at school, as part of a hobby or otherwise.

I know something about micro-electronic technology through reading, TV or through discussions with others.

I know very little about micro-electronic technology.

DON'T KNOW.